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ABSTRACT

This paper discusses a survey of 339 teachers at the University of Strathclyde, Glasgow. The purpose of the survey was to: (1) evaluate the impact of educational technology on teaching and learning at the university; (2) ascertain those areas where staff training and development were required; and (3) determine ways in which both teaching and learning could become more efficacious through the appropriate use of educational technology. Responses pertaining to the impact of educational technology revealed that while most teachers believe that slides, films, and computers would be appropriate aids to teaching, only overhead projectors are used with any frequency by both teachers and students. Responses pertaining to staff development needs revealed that the major areas for concentration are production of overhead projector materials and training in computer skills, computer usage, and computer/classroom integration. Finally, it was determined that several barriers would have to be removed before innovative instructional materials could be used appropriately, including lack of time available to develop innovations; ill-equipped facilities; scarcity of relevant hardware and software; and lack of knowledge, resources, and materials. (5 references) (DB)

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TECHNOLOGICAL AIDS IN TEACHING AND LEARNING

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September 1989

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INTRODUCTION

This research project is concerned with aspects of educational technology in the University of Strathclyde, and was promoted by the Advisory Group on the Applications of New Technologies in Teaching and Learning.

In December 1986 the University Senate approved a statement of general and more immediate aims and objectives in relation to the Rolling Academic Plan. One of the more immediate aims for the period 1986-1991 was to continue and to develop the modernisation of course content, course design and teaching methods. Later in December 1988 the Planning Secretariat in "Strathclyde 2000: A Forward Look" stressed the importance of the computer to teaching as well as to research.

There are different viewpoints expressed in the published literature on innovation related to education. Below are listed three contrasting views. Kogan and Becher (1980) state:

> "If a particular course is attracting a large surplus of good, well-qualified applicants, and the teachers responsible for that course are well satisfied with it, then they should not be expected to tinker with it merely at the behest of a self-instruction enthusiast or a devotee of inter-disciplinary inquiry."

Barker and Yeates (1985) in discussing the future of computer assisted learning and the likelihood of change in educational institutions suggest that:

> "Educational establishments are extremely conservative in their outlook. Thus, if they occur at all, these changes will only take place very slowly."

On the other hand, Ryan (1984) points out:

> "Generations of students will be coming into the Central Institutions who will have made their own video programmes and who have known computers since they were in primary school. In many of the professions for which the Central Institutions prepare, these devices are becoming standard tools..."

These three contrasting viewpoints on educational change are that, in a good established course, innovation is not necessary; that if innovation does come it will come very slowly; and that technologically aware students and employers will expect innovative technology.

In an attempt to establish the current position in the University a pilot study by Gordon and O'Hagan (1988) was undertaken focusing on five separate areas of the University. On the basis of the information gained from this study, a revised questionnaire was formulated for a wider target population. There were 17 questions, 11 of these open questions, to afford the respondents maximum opportunity to express their opinions. The target date for return was set at 10 March 1989.

The main aims of the survey were:

(1) to evaluate the impact of educational technology on

teaching and learning within the University;

(2) to ascertain those areas where staff training and development are required;

(3) to determine ways in which both teaching and learning could become more efficacious through the appropriate use of educational technology.

The target population for the survey was 669 members of teaching staff. The mailing list was derived from a centrally held computer print-out. Certain academic staff were excluded for various reasons such as being on sabbatical leave, transfers to non-teaching posts, long-term illness and so forth. The number of completed questionnaires returned was 339. There was a 53.3% response from Arts & Social Studies, 57.7% response from the Business School, 42.3% from Engineering and 52.4% from Science. The authors are aware that this may not necessarily be a representative sample of teaching staff but there can be no doubt that it reflects a wide body of opinion.

In a small number of cases it was necessary to make subjective judgements about responses although overall it was relatively easy to interpret the views of staff. The tables presented in this report indicate where no responses were made to a particular item.

RESULTS

The answers to the first question, which was concerned with the appropriateness of the several listed technological aids, were calculated as percentages and are presented in TABLE I. It can be

TABLE I APPROPRIATENESS OF TECHNOLOGICAL AIDS

(a) Total Responses Expressed as Percentages

	Very appro-priate	Appro-priate	Uncer-tain	In-appro-priate	Very in-appro-priate	No re-sponse
Overhead Proj-ector material	67.8	26.6	2.7	1.2	0.9	0.9
Audio-tapes	7.4	10.9	22.7	30.1	19.5	9.4
Slides	26.0	41.9	12.1	10.9	4.7	4.4
Tape-slides	3.2	16.2	32.5	21.5	12.1	14.5
Films/ Videotapes	24.5	42.2	13.6	10.3	4.1	5.3
Computer assis-ted learning	20.4	23.3	27.4	14.8	6.2	8.0
Others	16.8	18.9	20.1	8.6	5.3	30.4

(b) Responses separated into Faculties

Arts & Social Studies (%)

	V.app	App	Uncer-tain	Inapp	V in-app	N-R
OHP	47	41	8	4	0	0
A-T	33	31	20	10	2	4
Slides	20	39	12	16	6	6
T-slides	6	12	41	16	12	12
F/V	47	45	4	2	0	2
CAL	12	22	35	20	6	4
Others	14	16	22	10	4	33

Business (%)

	V.app	App	Uncer-tain	Inapp	V in-app	N-R
OHP	81	15	2	0	2	0
A-T	6	13	27	33	12	10
Slides	20	34	21	13	7	4
T-slides	3	15	37	20	10	15
F/V	28	47	12	6	4	3
CAL	16	18	32	15	11	9
Others	17	21	23	12	6	20

Engineering (%)

	V.app	App	Uncer-tain	Inapp	V in-app	N-R
OHP	70	26	2	1	0	0
A-T	1	6	26	27	26	14
Slides	34	50	7	5	2	2
T-slides	3	20	24	24	11	17
F/V	25	33	17	15	3	7
CAL	27	23	24	14	3	9
Others	19	22	17	8	6	28

Science (%)

	V.app	App	Uncer-tain	Inapp	V in-app	N-R
OHP	64	31	1	1	1	3
A-T	2	5	18	39	29	8
Slides	27	44	8	12	4	6
T-slides	2	16	31	23	15	13
F/V	11	44	17	14	6	7
CAL	22	29	23	13	5	8
Others	16	16	18	6	5	40

seen from TABLE I (a) that throughout the University overhead projector material is considered the most appropriate technological aid in class teaching. The order of the aids in the top category, i.e. "very appropriate", is overhead projector material, slides, films/videotapes, computer assisted learning (CAL), others, audio-tapes and tape-slides. However, when the total figures are broken down and attributed to the four faculties, a different picture emerges. Both the order of importance and the degree of importance attached to the technological aids change.

It is interesting to note that Arts & Social Studies in the "very appropriate" grade consider films/videotapes to be as important as overhead projector material and give some measure of importance to audio-tapes. Engineering and Science, on the other hand, consider slides and CAL to be of next importance to overhead projector material. The Business School shares the view of Arts & Social Studies on the appropriateness of film/videotapes but does not give the same degree of importance to them; on the other hand, it shares the opinion of Engineering and Science on the low appropriateness of audio-tapes. It is thus apparent that there are differences across faculties which the overall figures conceal.

When categorising CAL and "Others" the respondents were invited to specify the particular technological aids they were rating. There were 197 responses: 37% of these responses rated overhead projector display of computer monitor to have some measure of appropriateness; 21% thought the same for simulations and there was a 9% interest shown in expert systems.

TABLE II indicates the current use of technological aids, as

TABLE II USAGE OF TEACHING AIDS

(a) Total Responses Expressed as Percentages

	50% and above	25-49%	10-24%	1-9%	Never used	No response
Overhead Projector material	53.1	13.6	13.3	13.3	3.8	2.9
Audio-tapes	0.9	2.4	4.4	15.6	65.5	11.2
Slides	8.3	8.0	13.3	33.3	28.3	8.8
Tape-slides	0	0.3	1.8	10.0	74.3	13.6
Films/ Videotapes	0.9	5.9	16.5	38.9	30.4	7.4
Computer assisted learning	1.8	4.7	8.0	14.2	60.5	10.9
Others	1.8	1.8	5.0	13.6	55.8	22.1

(b) Responses separated into Faculties

Arts & Social Studies (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	25	12	22	24	10	6
A-T	4	12	16	31	33	4
Slides	8	2	10	33	35	12
T-slides	0	0	4	6	78	12
F/V	4	20	33	29	12	2
CAL	2	0	14	10	63	10
Others	0	2	2	10	65	20

Business (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	64	15	11	5	3	2
A-T	0	1	6	21	57	14
Slides	4	6	7	31	40	11
T-slides	0	0	1	14	69	16
F/V	1	3	20	44	23	8
CAL	1	3	4	15	64	13
Others	1	3	5	11	63	17

Engineering (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	59	16	9	12	1	2
A-T	1	0	1	11	74	12
Slides	14	12	20	35	14	5
T-slides	0	1	2	15	67	15
F/V	0	5	18	42	27	8
CAL	2	9	11	11	57	9
Others	2	2	8	15	47	26

Science (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	52	11	15	16	4	3
A-T	0	1	0	7	81	11
Slides	7	8	14	34	27	9
T-slides	0	0	1	5	83	11
F/V	0	3	5	37	47	8
CAL	2	5	6	15	59	11
Others	3	0	4	17	53	24

opposed to the perceived need for technological aids noted in TABLE I. It can be seen that overhead projector material emerges as being most often used and tape-slides as least often. Tape-slides was a category which sometimes had in the margin a question mark or a question (e.g. "What are these?") which confirms their low usage.

As well as the specific questions on the frequency of use, question 2 had open questions asking for comment on the use of the listed materials and seeking information about any differences in technological aids and teaching styles for different target groups. Eighty-nine staff replied to the section on the use of listed materials. Many of the comments suggested, not so much an unwillingness to embrace the new technologies, but rather a frustration at the barriers that prevented their usage. Nineteen per cent of the respondents to this section said that "time" was the enemy. New material had to be prepared since, as 8% pointed out, there was no suitable ready-prepared material for their particular subjects. Thirteen per cent wanted to draw attention to the fact that there were problems of overhead projectors not being in the rooms, or being poorly maintained, or being unsuitably sited. Eighteen per cent of the comments were to draw attention to the fact that blackboards and handouts were still favoured aids and within this group mention was made of the inadequacy of blackboard/whiteboard provision and poor maintenance of existing boards.

There were 59 replies to the question on whether differing teaching aids and styles were used for different target groups.

There were opposing viewpoints here: on the one hand that "the more advanced the group the less technology used" and on the other "the more sophisticated, the more sophisticated technology used". It seemed to be the case that individual lecturers were making their decisions on the basis of class size and course content among other factors.

TABLE III indicates the use that students make of the listed learning aids when studying. The question was intended to find out what technology was available to students for their use outwith lecture time but there seems to have been misinterpretation by some staff since there were comments about not understanding the question and treating it as a repeat of question 2. Apart from overhead projector material (which some specified as used for presentations) the other technological aids were rated for the majority of time as "never used". Again there was an open invitation to comment and 61 did so. Twenty per cent of this number said CAL was not available to the students, and 8% said students used notes and textbooks.

The fourth question in the survey was an open request to disclose involvement in any innovative teaching using technological aids. Only 60 staff responded to this invitation. There would seem to be a wide range of innovation in the "simulations-interactive-expert" field, usually department specific. The Arts & Social Sciences respondents were the only ones who declared any faculty-wide services, stating that there was wordprocessing tuition available to all staff and first year students in their faculty, and a faculty service for visually impaired students which

TABLE III USAGE OF LEARNING AIDS BY STUDENTS

(a) Total Responses Expressed as Percentages

	50% and above	25-49%	10-24%	1-9%	Never used	No response
Overhead Projector material	11.5	9.1	6.8	17.1	43.1	12.4
Audio-tapes	0.3	1.8	3.5	9.7	68.4	16.2
Slides	0.6	1.2	5.3	15.0	62.2	15.6
Tape-slides	0	0.3	0.6	7.1	73.4	18.6
Films/ Videotapes	0.6	2.4	7.1	23.0	51.0	15.9
Computer assisted learning	2.1	4.1	8.0	12.7	54.3	18.9
Others	2.6	1.8	2.1	3.2	57.2	33.0

(b) Responses separated into Faculties

Arts & Social Studies (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	4	6	2	8	57	22
A-T	2	12	12	16	43	14
Slides	0	0	0	6	69	24
T-slides	0	0	0	2	71	27
F/V	2	6	18	18	39	16
CAL	0	2	12	10	55	20
Others	2	2	4	6	51	35

Business (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	18	16	9	20	30	7
A-T	0	0	3	19	62	16
Slides	1	1	4	19	62	13
T-slides	0	0	0	15	66	19
F/V	1	2	9	35	39	14
CAL	0	3	2	16	60	19
Others	0	0	0	5	60	35

Engineering (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	10	7	6	23	41	14
A-T	0	0	3	5	73	19
Slides	1	3	8	16	53	18
T-slides	0	0	2	7	70	20
F/V	0	1	6	22	52	19
CAL	3	7	12	10	50	17
Others	6	2	3	2	56	31

Science (%)

	50%+	25-49%	10-24%	1-9%	Never used	N-R
OHP	10	6	8	14	50	11
A-T	0	0	0	3	82	15
Slides	0	0	6	15	67	12
T-slides	0	1	0	3	83	13
F/V	0	2	2	16	66	15
CAL	4	4	7	13	53	19
Others	3	3	2	1	59	32

used a computer Braille Maker program.

Question 5 was meant to elicit more specific information on the use of computer assisted learning, such as the target groups, the number and variety of machines being used and the types of software, whether bought or in-house. Seventy-one per cent of those who answered the questionnaire did not answer this question, presumably because it was not applicable, which could be interpreted as a 29% involvement with CAL. From the responses it would seem that there are fewer using CAL with first year students than in classes from second year onwards. Overall there appeared to be more commercial packages used than in-house, although in the Science Faculty there would seem to be slightly more in-house material than commercial. A wide variety of machines were reported to be in use including Amstrad, Macintosh and Atari.

Question 6 was an open invitation to put forward suggestions about the development of innovative teaching practices and to seek out potential assistance in passing on expertise concerning technological aids to other staff. There was also a request to provide information on any known innovations in other educational establishments. There were 148 answers to the development of innovative teaching question, answers which were many and varied and not always relevant to the question asked. Subjective judgements have had to be made in categorising these. The biggest single category was that of time (15%) such as pleas for time to develop innovative practices. If these are considered as linked to pleas for more staff, for technical back-up, for reduced teaching load and for recognition of time spent on development of

innovation, then this figure rises to 30%. The introduction of some form of computer assisted learning is wanted by 15%; 9% would like relevant video material; and 9% want staff development either in the form of specific training or in gaining knowledge of resources, materials and methods, or in the form of receiving advice (as one respondent suggested "workshops to discuss new technologies"). Again some respondents (8%) thought that innovation was not the top priority, that the condition of rooms, blackboards and so forth should be attended to first. This can be seen in the comment, "easy access to OHPs and slide projectors, good quality blackboards and good acoustics", plus the suggestion from someone else of "dimmer switches".

The request for potential assistance brought forth 16 members of staff willing to give their time to pass on their expertise to colleagues in areas from computer-aided graphics to the production of tape-slide presentations. Such expertise could prove to be extremely valuable in future staff development workshops.

There were not many replies to the question on innovative methods in other institutions. Among those mentioned were: Glasgow University for satellite T.V., for CAL for the Humanities, for computerised historical data and for audio self-teaching labs in their chemistry department; Surrey for a good modular electronics lab; Paisley College for multi-media presentations; Jordanhill College of Education for computer-aided assessment; and Oxford Polytechnic for course evaluation.

Question 7 was to obtain information on how important it was for staff to receive training in the listed technological aids. The results are shown in TABLE IV. It can be seen that the

TABLE IV THE IMPORTANCE OF STAFF TRAINING

(a) Total Responses Expressed as Percentages

	Very important	Important	Not sure	Unimportant	No response
Overhead Projector material	26.6	29.2	9.4	22.7	12.1
Audio-tapes	4.4	16.2	23.3	35.1	20.9
Slides	13.9	28.9	12.7	30.4	14.2
Tape-slides	5.0	20.7	23.9	29.8	20.7
Films/ Videotapes	13.3	31.6	15.6	23.3	16.2
Computer assisted learning	20.7	35.1	18.6	9.7	15.9
Others	15.6	24.8	18.9	9.4	31.3

(b) Responses separated into Faculties

Arts & Social Studies (%)

	Very imp.	Imp.	Not sure	Un-imp.	N-R
OHP	12	41	6	33	8
A-T	2	24	22	35	16
Slides	4	35	16	37	8
T-slides	0	33	20	29	18
F/V	6	51	8	29	6
CAL	16	41	20	8	14
Others	6	29	22	10	33

Business (%)

	Very imp.	Imp.	Not sure	Un-imp.	N-Rd
OHP	32	31	3	22	12
A-T	9	20	19	33	19
Slides	12	29	12	34	14
T-slides	7	21	22	32	17
F/V	17	32	11	22	18
CAL	27	34	18	7	14
Others	22	31	13	6	28

Engineering (%)

	Very imp.	Imp.	Not sure	Un-imp.	N-R
OHP	31	31	9	23	7
A-T	5	10	27	35	23
Slides	18	30	14	28	10
T-slides	7	18	25	27	23
F/V	14	34	19	20	12
CAL	23	31	20	10	16
Others	15	20	22	8	35

Science (%)

	Very imp.	Imp.	Not sure	Un-imp.	N-R
OHP	25	21	17	19	19
A-T	2	14	24	37	23
Slides	17	26	11	26	20
T-slides	4	17	26	31	23
F/V	13	20	20	24	22
CAL	16	37	17	12	19
Others	15	21	20	13	31

majority of respondents believe that training in overhead projector material has importance, and see the necessity for training in computer assisted learning. Fifty-nine staff specified their interests: 42% of these wanted training in overhead projector display of computer monitor, 17% in simulations and 10% in expert systems.

Question 7 had a sub-section which was intended to quantify training needs in specified computer skills. TABLE V indicates the interest in this area. Nine of the requests listed as "others" are related to computer graphics.

TABLE V STAFF TRAINING REQUIREMENTS

Keyboard Skills	Wordpro-cessing skills	Use of data-bases	Use of spread-sheets	Use of hyper-text	Others
126	149	180	128	110	26

Question 8 was again an open question inviting staff to state what extra resources they would like introduced into their departments, for teaching purposes by staff and for learning purposes by students. There were 211 staff who gave their ideas on extra teaching resources. Again subjective judgements have had to be made in categorising these. The biggest category relates to accommodation. There were 38 comments on ways to improve the present situation, including suggestions on refurbishment, that all

lecture rooms and theatres should have overhead projector facilities, slide projectors, video monitors, improved blackboard facilities and decent black-out. Thirty-seven requests related to computer hardware, such as one for every member of staff, more departmental computers, more workstations, more Macs, more Amstrad 1640s and so forth. Twenty-seven suggestions related to software, many of these naturally being department specific. There were 23 respondents interested in having available overhead projection of computer monitors. There was a measure of interest shown in videos, video cameras and in extra technical staff to help produce the required software and to give advice. Requests were also made for the equipment to produce overhead projector material and 35mm slides. To some extent these views are summed up in the words of one staff member, "Hardware, software, support staff, training".

To the part of the question on resources for student learning, 129 replied, 41 considering more computers necessary and a further 9 suggesting better access to hardware. There were 34 who stressed the importance of more software (this figure includes programmed learning packages). Study rooms, more videos and departmental libraries of video-tapes were other suggestions.

Question 9 was aimed at discovering staff desire for and ideas on a major University-wide resource centre for audio-tapes, slides, videotapes, CAL software, etc. There were 261 replies, 174 in favour of a central resource centre and 87 against. The faculty results are shown in TABLE VI.

TABLE VI DECISIONS ON A MAJOR UNIVERSITY-WIDE RESOURCE CENTRE

	Arts & Social Studies	Business	Engineering	Science
Yes	31	51	35	57
No	9	8	37	33

It can be seen that both Arts & Social Studies and the Business School are strongly in favour.

Among the suggestions made were that it should be a library-type service, centrally funded and thus free to the users. It should have a viewing room, should be well stocked with updated material and well catalogued. It was also thought by some that it should be more than a library service, that advice on hardware and software should be available and also recommendations on these. There were very few suggestions on locations, but among these were the Library, the Audio-Visual Centre, the Centre for Academic Practice and comments that it should be central and "not at the edge of Campus".

The final question was seeking views on those technological innovations which are necessary for distance learning. There were only 83 suggestions and 18 of these were negative, some pointing out the obstacles of expense and some stating that distance learning had low priority. Satellite links, CAL software and videotapes were the most common suggestions. Electronic mail was mentioned and there were reminders issued that high technology is

not essential and that printed material and books by post could be effective.

DISCUSSION

One of the major aims of this survey was to evaluate the impact of educational technology on teaching and learning. The results show that, although the majority of the respondents believe that overhead projector material, slides and films/videotapes would be appropriate technological aids in teaching their classes, and although many (44%) believe that computer assisted learning would also be appropriate (TABLE I), in practice only overhead projector material is used with substantial frequency (TABLE II). As learning aids only overhead projector material is used by students with any frequency (TABLE III). These three tables highlight the difference between the technological image of the University and the reality of its teaching practices.

Another aim of the survey was to ascertain those areas where staff training and development are required. Although interest was shown in training in all the listed technological aids (TABLE IV), it is apparent that the major areas for concentration are the production of overhead projector material (56%) and the expansion of knowledge regarding computer assisted learning methods (56%). Also it is obviously desired that training should be made available in computer skills and usage, such as wordprocessing and the use of databases (TABLE V).

The third aim was to determine ways in which both teaching and

learning could become more efficacious through the appropriate use of educational technology. The answers to the open questions suggested what the barriers were between the staff and the innovation of technological teaching aids, namely:

(1) **time** - an expressed lack of time for reasons such as heavy teaching load, lack of teaching staff, lack of technical back-up staff and lack of recognition for time spent on developing innovation;

(2) **accommodation** - ill equipped teaching rooms;

(3) **availability** - of hardware and relevant software;

(4) **lack of knowledge** - of resources, materials and methods.

The availability of funding and training will determine the extent to which such perceived barriers can be removed. However it must be acknowledged that a large part of the University resources is already allocated to computer-related expenses, over £628,000 for 1988/89. Verbal information from the Computer Centre on the situation at June 1989 indicates that there are now around 500 micros in 13 centrally managed rooms. These are available for 40 hours per week for teaching purposes and are apparently booked for about 80% of the time. These figures indicate that computers are being used, yet the results of this survey suggest only 29% of respondents use CAL in teaching. This low percentage would imply that the computer, hardware and software, is not yet fully integrated into the teaching and learning process.

In the introduction three current viewpoints were presented. The first was that innovation is not necessary in a well-established course. The results indicate that as a whole the

University is not pursuing this policy, although there were a few individual comments made that would endorse this view. Perhaps, when classes are very large, this might be judged the most cost-effective path but technological aids such as computer assisted learning could ease staff burdens in the long term. The second viewpoint was that innovation will take place very slowly. Speed in this case is relative. While the replies to the known innovations in other institutions indicated that in some areas other tertiary education establishments may be ahead, the only way to obtain a proper yardstick is to carry out similar surveys with other comparable institutions. The third viewpoint was one of consumer-led demand, that technically aware students and employers would expect innovative technological teaching aids. This last point takes on major importance given the proposed changes about to take place in university funding and the consequent competition for students. Strathclyde University is a technological university. While the validity of any claim to excellence can always be checked from facts and figures, such a claim may lack face validity if the University is not seen to be in the forefront with technological teaching aids in the delivery of high quality education.

In these circumstances, are the first two viewpoints even open to consideration?

REFERENCES

BARKER, P and YATES, H (1985) — Introducing Computer Assisted Learning. Englewood Cliffs, New Jersey: Prentice/Hall International.

GORDON, G and O'HAGAN, F (1988) — The Use of Technology in Teaching and Learning: A Pilot Study. University of Strathclyde: Centre for Academic Practice.

KOGAN, M and BECHER, A (1980) — Patterns of Change. The Times Higher Education Supplement (2 May 1980).

PLANNING SECRETARIAT (1988) — Strathclyde 2000: A Forward Look. Glasgow: University of Strathclyde (A restricted document).

RYAN, D (1984) — Development and Constraint Innovations in Teaching Methods and Staff Development in the Scottish Central Institutions. Glasgow: The Queen's College.